

5.1b Log Differentiation: p. 330-331

#93, 95, 97, 103, 106

$$\ln(ab) = \ln a + \ln b$$

93) $y = x\sqrt{x^2-1}$

$$\ln y = \ln[x(x^2-1)^{1/2}]$$

$$\ln y = \ln x + \frac{1}{2}\ln(x^2-1)$$

$$\frac{1}{y}\left(\frac{dy}{dx}\right) = \frac{1}{x} + \frac{1}{2}\left(\frac{2x}{x^2-1}\right)$$

$$\frac{dy}{dx} = y \left[\frac{1}{x} + \frac{x}{x^2-1} \right]$$

$$\frac{dy}{dx} = x\sqrt{x^2-1} \left[\frac{1}{x} + \frac{x}{x^2-1} \right]$$

95) $y = \frac{x^2\sqrt{3x-2}}{(x-1)^2}$

$$\ln y = \ln \left[\frac{x^2(3x-2)^{1/2}}{(x-1)^2} \right]$$

$$\ln y = \ln x^2 + \ln(3x-2)^{1/2} - \ln(x-1)^2$$

$$\ln y = 2\ln x + \frac{1}{2}\ln(3x-2) - 2\ln(x-1)$$

$$\frac{1}{y}\left(\frac{dy}{dx}\right) = 2\left(\frac{1}{x}\right) + \frac{1}{2}\left(\frac{3}{3x-2}\right) - 2\left(\frac{1}{x-1}\right)$$

$$\frac{dy}{dx} = y \left[\frac{2}{x} + \frac{3}{2(3x-2)} - \frac{2}{x-1} \right]$$

$$\frac{dy}{dx} = \frac{x^2\sqrt{3x-2}}{(x-1)^2} \left[\frac{2}{x} + \frac{3}{2(3x-2)} - \frac{2}{x-1} \right]$$

$$97) y = \frac{x(x-1)^{3/2}}{\sqrt{x+1}}$$

$$\ln y = \ln \left[\frac{x(x-1)^{3/2}}{(x+1)^{1/2}} \right]$$

$$\ln y = \ln x + \ln(x-1)^{3/2} - \ln(x+1)^{1/2}$$

$$\ln y = \ln x + \frac{3}{2} \ln(x-1) - \frac{1}{2} \ln(x+1)$$

$$\frac{1}{y} \left(\frac{dy}{dx} \right) = \frac{1}{x} + \frac{3}{2} \left(\frac{1}{x-1} \right) - \frac{1}{2} \left(\frac{1}{x+1} \right)$$

$$\frac{dy}{dx} = y \left[\frac{1}{x} + \frac{3}{2(x-1)} - \frac{1}{2(x+1)} \right]$$

$$\frac{dy}{dx} = \frac{x(x-1)^{3/2}}{\sqrt{x+1}} \left[\frac{1}{x} + \frac{3}{2(x-1)} - \frac{1}{2(x+1)} \right]$$

$$103) \ln x + \ln 25 \neq \ln(x+25) \\ = \ln(25x)$$